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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Martin MIEHLING

Application No.: 09/512,223

Filed: February 24, 2000

For: TRANSPONDER AND INJECTION-MOLDED PART AND METHOD FOR MANUFACTURING SAME

Group Art Unit: 2841

Examiner: T. Dinh

Docket No.: 104142

#8/Amdt A
R Tyson
11/21/01

AMENDMENT

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

In reply to the Office Action mailed August 14, 2001, please amend the above-identified application as follows:

IN THE CLAIMS:

Please replace claims 1, 4-6, 13 and 16 as follows:

Sub B1

A1

1. (Amended) An electrical circuit comprising an integrated circuit, an antenna and one or more electrical connections between the integrated circuit and the antenna, wherein at least the integrated circuit and the antenna are encapsulated within a capsule such that the capsule mechanically connects the integrated circuit and the antenna to hold the integrated circuit and the antenna in a fixed position relative to each other, and wherein the capsule comprises a thermoplastic resin having a melting point of from 120°C to 250°C.

A2

4. (Amended) The electrical circuit according to Claim 1, wherein the electrical circuit is encapsulated within the capsule such that at least one or more electrical connections are encapsulated by the thermoplastic resin.

5. (Amended) The electrical circuit according to Claim 1, wherein the antenna is a coil.

A2 Sub B2 Cont'd

6. (Amended) Transponder comprising an electrical circuit containing at least one component suitable for interaction with an electromagnetic field encapsulated within a capsule, wherein the capsule comprises a thermoplastic resin having a melting point of from 120°C to 250°C, and wherein the electrical circuit is encapsulated by the thermoplastic resin such that at least an integrated circuit and an antenna of the electrical circuit are encapsulated by the thermoplastic resin and are mechanically connected by the thermoplastic resin to hold the integrated circuit and the antenna in a fixed position relative to each other.

A3

13. (Amended) Transponder according to Claim 6, wherein the capsule further comprises at least one supporting element projecting from a surface of the capsule.

A4

16. (Amended) Method of manufacturing a transponder comprising an electrical circuit containing at least one component suitable for interaction with an electromagnetic field encapsulated within a capsule, wherein the capsule comprises a thermoplastic resin having a melting point of from 120°C to 250°C, and wherein the electrical circuit is encapsulated by the thermoplastic resin within the capsule such that at least an integrated circuit and an antenna of the electrical circuit are encapsulated by the thermoplastic resin and are mechanically connected by the thermoplastic resin to hold the integrated circuit and the antenna in a fixed position relative to each other, comprising

placing at least one of the electrical circuits in a cavity of a mold, and

feeding the thermoplastic resin in molten form into the cavity to encapsulate the at least one electrical circuit and form the capsule, wherein the feeding is conducted at a temperature of from 120°C to 260°C and at a pressure of from 5 to 40 bars.

REMARKS

Claims 1-38 are pending herein, claims 1-15 under consideration and claims 16-38 being presently withdrawn from consideration. By this Amendment, claims 1, 4-6, 13 and 16 are amended.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

No new matter is added by this Amendment. The amendments to claims 1, 6 and 16 are supported by the original specification, for example at least at page 7, lines 18-21 and as shown throughout the original Figures. The amendments to claims 4 and 5 correct an antecedent basis issue in the preamble of these claims. The amendment to claim 13 addresses the alleged indefiniteness of the word "its" in original claim 13.

I. Rejection Under 35 U.S.C. §112, Second Paragraph

Claim 13 was rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite. In particular, it was alleged that the term "its" in claim 13 was unclear as to what was being referred to. This rejection is respectfully traversed.

By this Amendment as discussed above, claim 13 has been amended to recite that the at least one supporting element projects from a surface of the capsule. In view of this amendment to claim 13, Applicant respectfully submits that claim 13 is clear and definite in accordance with the requirements of 35 U.S.C. §112, second paragraph. Reconsideration and withdrawal of this rejection are respectfully requested.

II. Rejection Under 35 U.S.C. §102(b)

Claims 1-15 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by U.S. Patent No. 5,574,470 (hereinafter de Vall). This rejection is respectfully traversed.

By way of background, the presently claimed invention relates to an electrical circuit and transponder containing such electrical circuit in which an integrated circuit and an

antenna are electrically connected. Because the only mechanical connection between the integrated circuit and the antenna is initially comprised of only thin antenna wires (typically 20 microns to 60 microns thick), the connected integrated circuit and antenna are easily destroyed in typical further packaging processes such as lamination and molding. Thus, as discussed in the background section of the present application, making an intact electrical circuit with such design is very difficult.

The present invention addresses this problem by encapsulating at least the integrated circuit and the antenna (and preferably also the electrical connections between the integrated circuit and the antenna) in a thermoplastic resin having a melting point of from 120°C to 250°C such that the thermoplastic resin contacts and mechanically connects these components in a fixed relationship respective to each other. This renders the circuit easily handleable for further processing and also protects the integrity of the electrical circuit in subsequent packaging processes.

Applicant respectfully submits that de Vall neither teaches nor suggests the electrical circuit and transponder of the presently claimed invention.

de Vall describes a transponder in which the transponder components are all formed on either side of a supporting substrate, the substrate and components thereon ultimately being encased within protective laminates (58,60) bonded to each other at a periphery around the substrate and at a center portion through an open slot in the substrate. de Vall differs from the electrical circuit of present claim 1 and the transponder of present claim 6 in several material respects, and thus nothing in de Vall would have taught or suggested the presently claimed invention to one of ordinary skill in the art.

First, de Vall describes a transponder prepared in a conventional manner in which a substrate is used and upon which all the transponder components are mounted. For example as is detailed at column 4, lines 14-26 of de Vall, the substrate is the carrier which forms (i.e.,

supports) the mechanical connection between the components and it is where the electrical connection pads are based. The substrate mechanically connects the integrated circuit and antenna. Thus, the integrated circuit is only indirectly connected to the antenna coils as clearly shown in Figure 3 where the die pads 64a to 64e are connected to the bond pads 12a to 12e by suitable means such as wire bonds. See column 4, line 61.

Thus, de Vall teaches the necessary use of a substrate to form the mechanical connection between the transponder components and the antenna coils. This is completely different from the presently claimed in which a capsule of thermoplastic resin having a melting point of from 120°C to 250°C contacts and mechanically connects the integrated circuit and the antenna.

Not only is the substrate 10 in de Vall not a capsule, the substrate is not comprised of a thermoplastic resin material having a melting point of from 120°C to 250°C. As the substrate 10 must not melt or deform during subsequent processing in de Vall, including formation of the protective laminates 58, 60 around the substrate, it is evident that de Vall not only fails to describe that the substrate 10 would be comprised of a thermoplastic resin having a melting point of from 120°C to 250°C, it in fact teaches against such material comprising substrate 10.

Second, the substrate 10 in de Vall that is necessary to form the mechanical and electrical connection between the integrated circuit and antenna coils is insufficient alone to protect the circuitry from damage or destruction and further processing. In other words, the substrate of de Vall does not hold the integrated circuit and the antenna in a fixed position relative to each other such that the material can be readily handled and subjected to further processing without damage as in the presently claimed invention.

In fact, de Vall teaches that extensive further processing steps must be undertaken to protect the unprotected mounted components upon the substrate for further packaging

processing. For example, a dielectric protective coating (see column 12, lines 46-48) must first be applied atop the antenna coils on each side of the substrate. Then, an additional non-conductive encapsulation of the integrated circuit and wire-bond connections (a typical protection step in conventional integrated circuit assembly known in the art as GLOB-TOP) (see column 12, lines 52-53) must also be applied. Only then may the protected circuits in de Vall be subjected to further packaging processing without damage.

As discussed above, the present invention overcomes these drawbacks of conventional integrated circuit formation. The present electrical circuit is not built up upon a substrate as in de Vall. Rather, the integrated circuit is directly connected to the antenna. The mechanical connection between the integrated circuit and the antenna is then secured through use of the thermosplastic resin having a melting point of from 120°C to 250°C to thereby hold the integrated circuit and antenna in a fixed position relative to each other such that the integrated circuit and antenna can be readily handled and further processed without destruction. de Vall fails to teach or suggest such an efficient design in which a capsule mechanically connects the integrated circuit and the antenna to hold the integrated circuit and the antenna in this fixed, protective position relative to each other.

Third, the Patent Office alleged that the protective laminates 58, 60 in de Vall constituted the capsule within the meaning of the present claims. Applicant respectfully disagrees. First, the protective laminates 58, 60 in de Vall merely form outer sheets around the substrate and transponder components thereon. As clearly described at column 4, lines 43-47 of de Vall, the covers do not adhere to the substrate, transponder components thereon, or the additional protective layers discussed above. Rather, the covers merely adhere to themselves around the perimeter of the device and at an area through the center of the device. As such, these covers 58 and 60 in de Vall do not constitute capsules that mechanically connect the integrated circuit and the antenna to hold the integrated circuit and antenna in a

fixed position relative to each other. As discussed above, it is the function of the substrate in de Vall to mechanically connect the components, not the additional protective layers on each side of the substrate.

Further, de Vall teaches that the covers 58 and 60 preferably are comprised of PVC. PVC cannot be used as the thermoplastic resin of the capsule of the present invention. As described on page 6 of the present specification, the thermoplastic resin preferably has no viscosity so that injection can be done at a low pressure as well as low temperature, thereby preserving the integrity of the circuit during the encapsulation. PVC is a material well recognized to have a high viscosity. While such material is suitable for the outer sheaths of transponders as in de Vall and also in the present invention (see page 9, lines 15-16), it is not suitable as a material for the capsule of the electrical circuit and transponder.

Applicant thus respectfully submits that it is not correct to assert that the covers 58 and 60 in de Vall correspond to the capsule of the claimed electrical circuit and transponder that mechanically connects the integrated circuit and the antenna in a fixed position relative to each other.

With particular respect to dependent claim 4, de Vall also fails to teach or suggest one or more electrical connections encapsulated by the thermoplastic resin. As discussed above, the covers 58 and 60 in de Vall are specifically described to be formed around the substrate, transponder components (including conductive leads and pads) and protective layers thereover. As such, the electrical connections are not encapsulated by the material of the covers 58 and 60, these covers merely providing a sheath around an outer perimeter of the transponder.

Regarding dependent claim 7, the Patent Office alleged that de Vall describes a polyamide as a thermoplastic resin at column 3, lines 39-50. However, de Vall is here describing materials for the substrate 10, not materials for the protective covers 58 and 60

that the Patent Office alleges would correspond to the capsule. Thus, polyamide is not described in de Vall as a material for the covers 58 and 60, and thus even under the Patent Office's own reasoning, de Vall does not describe polyamide as a material that encapsulates the components of an electrical circuit or transponder.

Regarding dependent claims 8 and 9, the Patent Office alleged that de Vall describes a cover layer of laminated plastic film in Figure 8 as layers 131 and 135. However, Figure 8 in de Vall illustrates an embodiment in which layers 131 and 135 are used in place of the protective covers 58 and 60, layers 131 and 135 being comprised of a dielectric coating such as an etchant maskant. See column 9, lines 17-22 of de Vall. These layers 131 and 135 in de Vall would thus have to be considered analogous to the protective covers 58 and 60 in de Vall and cannot also be considered to be cover layers upon a surface of a capsule. In Figure 8 of de Vall, garment/cloth layers 141 and 133 might be considered cover layers, but these are not plastic and are not laminated films as required in dependent claims 8 and 9.

Regarding dependent claim 14, this claim recites that the capsule includes a material used as a mold during encapsulation with the thermoplastic resin. de Vall fails to teach or suggest any feature even remotely relevant to this aspect of the claimed invention. The portions of de Vall cited in the Office Action have nothing to do with the use of molds as portions of a capsule.

Finally, regarding dependent claim 15, the Patent Office alleged that de Vall shows a sheath as layers 141 and 131 in Figure 8. However, as noted above, layer 131 is a dielectric coating that is used analogous to covers 58 and 60, and layer 141 is a garment. As such, neither of these layers teaches or suggest an injection molded resin sheath.

For all the foregoing reasons, Applicant respectfully submits that de Vall fails to teach or suggest the invention of claims 1-15. Reconsideration and withdrawal of this rejection are respectfully requested.

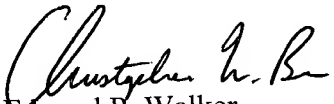
III. Rejoinder

Claim 16 recites a method for manufacturing a transponder including all of the limitations of claim 6. Accordingly, upon allowance of claim 6, claims 16-28 should be rejoined with the application and similarly allowed.

IV. Conclusion

In view of the foregoing amendments and remarks, Applicant submits that claims 1-38 are in condition for allowance. Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,



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Date: November 14, 2001

Attachment:
Appendix

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DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461